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We may observe that every algebraic identity, in which each term is of the second degree in so far as certain letters are concerned, may be given a geometric interpretation if each of such letters be used to represent a certain vector, and if the scalar but not the vector portion of the product be employed in the interpretation. That this is true follows from the fact that the non-commutative character of vector multiplication does not alter or affect the scalar portion of the product, if each term of such product contains either the product of two separate vectors or the square of some one vector; i. e., if no term in the expanded form is of a degree higher or lower than the second in the letters used to designate vectors.

A solution similar to the foregoing may be employed in problem 377.

384. Proposed by S. LEFSEHETZ, Clark University.

Let  $ABC$  be a triangle,  $O$  a circle tangent to its three sides,  $T$  a variable tangent of  $O$ , which cuts the sides  $BC$ ,  $CA$ ,  $AB$  in  $a$ ,  $b$ ,  $c$ .  $Oa'$ ,  $Ob'$ ,  $Oc'$  the perpendiculars in  $O$  to  $Oa$ ,  $Ob$ ,  $Oc$ , cutting, respectively,  $T$  in points  $a'$ ,  $b'$ ,  $c'$ . Prove that  $Aa'$ ,  $Bb'$ ,  $Cc'$  meet in a point  $t$ , and find the locus of  $t$  when  $T$  varies. Purely geometrical proofs wanted.

No solution of this problem has been received.

385. Proposed by V. M. SPUNAR, M. and E. E., Chicago, Ill.

Given a triangle  $ABC$ , find the radius of a circle touching two of its sides and a line parallel to the third, at a distance  $d=u+2r$ .

Solution by A. H. HOLMES, Brunswick, Maine.

Let  $a$ ,  $b$ , and  $c$  be the sides of the given triangle,  $c$  the base. Then  $h$ =altitude of the triangle= $\frac{\sqrt{[4a^2c^2-(a^2-b^2+c^2)]}}{2c}$ , and  $R$ =radius of the inscribed circle= $\frac{\sqrt{[4a^2c^2-(a^2-b^2+c^2)]}}{2(a+b+c)}$ .

Put  $r$ =radius of circle touching  $a$  and  $b$  and a line parallel to  $c$  at a distance from  $c$ ,  $2r+u$ . Then  $h:R=h-(2r+u):r$ .

$$\therefore r = \frac{(h-u)R}{h+2R}.$$

Putting for  $h$  and  $R$  their values in terms of  $a$ ,  $b$ , and  $c$ , we have,

$$r = \frac{\sqrt{[4a^2c^2-(a^2-b^2+c^2)^2]}-u}{a+b+3c}.$$

CALCULUS.

306. Proposed by FRANCIS RUST, C. E., Pittsburg, Pa.

Express in elliptic integrals:  $A_\theta = \int_0^\theta \frac{dx}{\sqrt{(1-x^4)}}; 0 < \theta < 1.$